Global Alignment: aligning mutr + muid

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Outline

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Summary

Aim of the presentation:
See if Millepede corrections Mutr+Muid (on top of survey) are better than Mutr alone (on top of survey).

This slides show:

- Precision and magnitude of Millepede's corrections

- Summary of DG0 comparisons

- Projection of residual means in the mutr and the muid

Outline

Offsets found by Millepede after Reco2

MuTr and MuID

Legend:

- The top plot shows w offsets in cm vs each detector (one point per half octant and panel). Bottom plot is the number of tracks per detector.

- In blue are the input misalignments = input misalignments same as in reco1 + corrections found by Millepede in reco1; in red the misalignments found by Millepede. The dashed lines separate the cathodes and planes. The black straight line show the detectors which have less than 5 tracks.
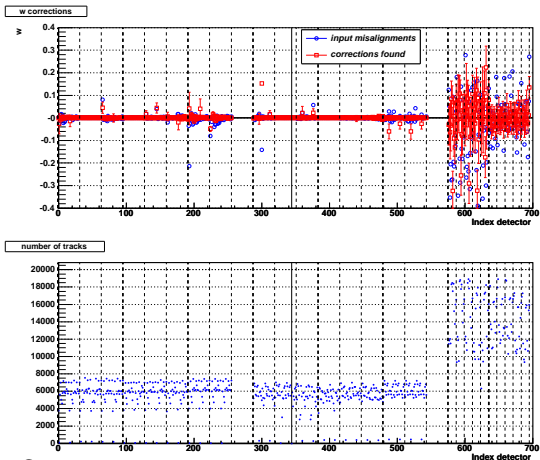
Comments:

- Note that the Muid alignment has a precision of $\approx 2mm$ on it's corrections whereas Millepede aligned the Mutr to $\approx 0.3mm$.

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DG0 distributions

- Repass done on run5pp using Millepede corrections for Mutr+Muid (on top of survey).
- Detailed comparaison of DG0 distributions values (DG0x,y vs panel, DG0r, phi vs octant) between all configuration can be found at:
  http://www.phenix.bnl.gov/phenix/WWW/publish/silvestr/talks/PR_meeting_06_09_01/DG0.ps

Configurations setup
- Melynda: Melynda corrections in the Mutr + Muid (as applied to AuAu run4).
- MelSurveyPhi: Melynda corrections in the Mutr + phi corrections + muid survey.
- CathSurveyPhi: Millepede Mutr corrections on top of muid survey + phi corrections.
- CathMutrMuidSurveyPhi: Millepede Mutr+Muid corrections on top of muid survey + phi corrections.

DG0 means and sigmas integrated values

Mean	DG0x south	DG0x north	DG0y south	DG0y north	DG0r south	DG0r north
Melynda	1.20 ± 0.06	-0.16 ± 0.03	0.61 ± 0.06	-0.01 ± 0.03	-1.50 ± 0.06	-0.29 ± 0.03
MelSurveyPhi	0.43 ± 0.06	-0.18 ± 0.03	-0.12 ± 0.05	0.03 ± 0.03	-0.08 ± 0.06	-0.31 ± 0.03
CathSurveyPhi	0.41 ± 0.05	-0.02 ± 0.03	-0.06 ± 0.05	-0.12 ± 0.03	0.10 ± 0.06	-0.22 ± 0.03
CatMutrMuidSurPhi	0.08 ± 0.05	0.04 ± 0.03	0.14 ± 0.05	0.16 ± 0.03	-0.24 ± 0.05	-0.39 ± 0.03
MC	0.00 ± 0.03	-0.01 ± 0.02	-0.01 ± 0.03	0.02 ± 0.01	0.00 ± 0.03	-0.04 ± 0.02

Sigma	DG0x south	DG0x north	DG0y south	DG0y north	DG0r south	DG0r north
Melynda	5.56 ± 0.06	2.86 ± 0.03	5.48 ± 0.06	2.87 ± 0.03	5.92 ± 0.06	3.05 ± 0.03
MelSurveyPhi	5.55 ± 0.06	2.84 ± 0.03	5.12 ± 0.05	2.73 ± 0.02	5.82 ± 0.06	2.97 ± 0.03
CathSurveyPhi	5.26 ± 0.06	2.88 ± 0.03	5.09 ± 0.05	2.76 ± 0.02	5.44 ± 0.06	3.02 ± 0.03
CathMutrMuidSurveyPhi	5.20 ± 0.06	2.82 ± 0.03	5.08 ± 0.05	2.79 ± 0.03	5.36 ± 0.06	2.96 ± 0.03
MC	4.76 ± 0.03	2.53 ± 0.01	4.77 ± 0.03	2.49 ± 0.01	4.99 ± 0.03	2.66 ± 0.01

- CathMutrMuidSurveyPhi means are not better than CathSurveyPhi (Millepede Mutr + survey + phi): aligning the muid does not improve mutr results.
- For DG0y north, MelSurveyPhi (Melynda's Mutr corrections + survey) is better than others → Millepede's alignment of the Mutr not always the best ? Looking in details, only panel 4 (octant 6) show bigger offsets.
- Still, for most of the panels, DG0x and DG0y distributions show better means (see detailed presentation).
- There are still some offsets for some distributions of $\approx 2mm$. Given the statistics used to get Millepede's corrections, the error of the Muid corrections are of the same order of magnitude as DG0 offsets. This explains why aligning with Muid corrections do not always improves DG0 distributions.
- Sigmas are almost always better but still not as good as MC.

DG0r as an example

DG0r: Mean SOUTH	octant 0	octant 1	octant 2	octant 3
Melynda	-2.35 ± 0.21	-4.75 ± 0.16	0.19 ± 0.14	-2.36 ± 0.15
MelSurveyPhi	-0.68 ± 0.24	-1.32 ± 0.16	0.21 ± 0.14	0.43 ± 0.15
CathSurveyPhi	-0.10 ± 0.17	-1.41 ± 0.14	0.53 ± 0.14	1.22 ± 0.15
CatMutrMuidSurPhi	0.00 ± 0.16	-1.54 ± 0.15	-0.41 ± 0.14	0.57 ± 0.15

	octant 4	octant 5	octant 6	octant 7
Melynda	0.07 ± 0.18	0.92 ± 0.15	-2.39 ± 0.15	-1.61 ± 0.16
MelSurveyPhi	0.97 ± 0.20	0.47 ± 0.15	0.18 ± 0.15	-1.19 ± 0.16
CathSurveyPhi	0.48 ± 0.16	0.34 ± 0.15	0.56 ± 0.14	-0.94 ± 0.16
CatMutrMuidSurPhi	0.25 ± 0.16	-0.77 ± 0.14	-0.11 ± 0.16	0.39 ± 0.16

DG0r: Mean NORTH	octant 0	octant 1	octant 2	octant 3
Melynda	0.15 ± 0.09	-1.16 ± 0.10	-0.26 ± 0.10	-0.57 ± 0.10
MelSurveyPhi	0.50 ± 0.09	-0.52 ± 0.08	-0.92 ± 0.09	-0.23 ± 0.09
CathSurveyPhi	0.10 ± 0.10	-0.26 ± 0.08	-0.43 ± 0.10	0.09 ± 0.08
CatMutrMuidSurPhi	-0.19 ± 0.08	-1.28 ± 0.08	-0.21 ± 0.10	-0.55 ± 0.08

	octant 4	octant 5	octant 6	octant 7
Melynda	-0.86 ± 0.09	0.14 ± 0.11	0.09 ± 0.08	0.33 ± 0.11
MelSurveyPhi	-0.70 ± 0.09	-0.22 ± 0.11	-0.41 ± 0.08	-0.14 ± 0.12
CathSurveyPhi	-0.15 ± 0.09	-0.09 ± 0.10	-1.16 ± 0.08	0.25 ± 0.12
CatMutrMuidSurPhi	-0.24 ± 0.09	0.05 ± 0.11	-1.15 ± 0.09	1.05 ± 0.11

Comments:

- There are still some large offsets, up to 15mm for panels 1, 6 and 7. Those offsets are much larger than the precision on Millepede alignment: we are still missing something.

Outline

Mutr Residual means' projection

south

north
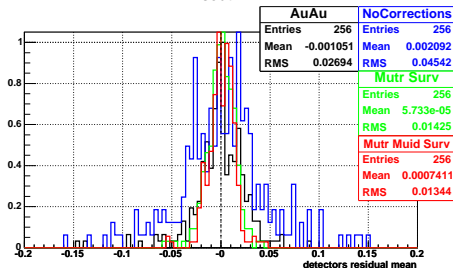
Legend: The histograms are the projection on the y axis (offsets in cm) of the residuals mean values in the Mutr (one entry per half octant).

- black: AuAu;
- blue: no corrections (survey only).
- green: Millepede, MuTr + survey.
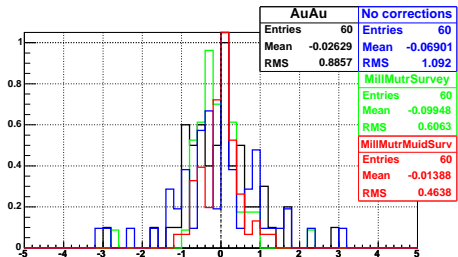- red: Millepede, MuTr Muid + survey;

SOUTH:
    Means: MutrMuid $\simeq$ Mutr $<$ Survey $<$ AuAu
    Sigma: MutrMuid $<$ Mutr $<$ AuAu $<$ Survey

NORTH:
    Means: Mutr $<$ MutrMuid $<$ AuAu $<$ Survey
    Sigma: MutrMuid $<$ Mutr $<$ AuAu $<$ Survey

Millepede give the best residuals, and aligning Mutr + Muid the smallest sigmas.

Residual means' projection
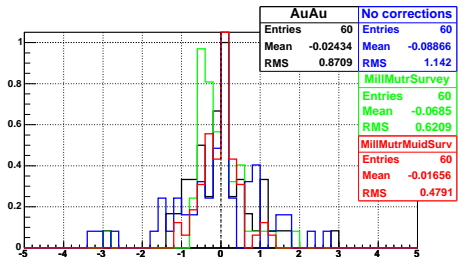
south

north

Legend: The histograms are the projection on the y axis (offsets in cm) of the residuals mean values in the MuID (one entry per muid panel).

- black: AuAu;
- blue: no corrections (survey only).
- green: Millepede, MuTr + survey.
- red: Millepede, MuTr Muid + survey;

Comments: The RMS is larger than the typical error on Muid corrections so that aligning the Muid improves the results.

SOUTH:
    Means: Mutr < MutrMuid < AuAu < Survey
    Sigma: MutrMuid < Mutr < AuAu < Survey

NORTH:
    Means: MutrMuid < AuAu < Mutr < Survey
    Sigma: MutrMuid < AuAu < Mutr < Survey

Millepede Mutr + Muid give the best residuals, and the smallest sigmas.

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Conclusions

Global alignment status:

- All residuals in the Muid can be found at:

  http://www.phenix.bnl.gov/phenix/WWW/publish/silvestr/talks/PR_meeting_06_09_11/

  residuals_RD_Mutr_comparingMillepedeMelyndaSurvey.ps

  residuals_RD_Muid_comparingMillepedeMelyndaSurvey.ps

- Aligning Mutr+ Muid gives better residuals in the Muid, and as good as aliging only the Mutr when looking at the Mutr residuals.

- Aligning the Muid with the Mutr should improve the DG0 distributions if we use more statistics in order to reduce the error bars on muid correction to less than a mm.

- There are still some large not understood offsets for some panels / octants.

Todo list:

- Write a technical note.

- Look at run6pp to have more stat.